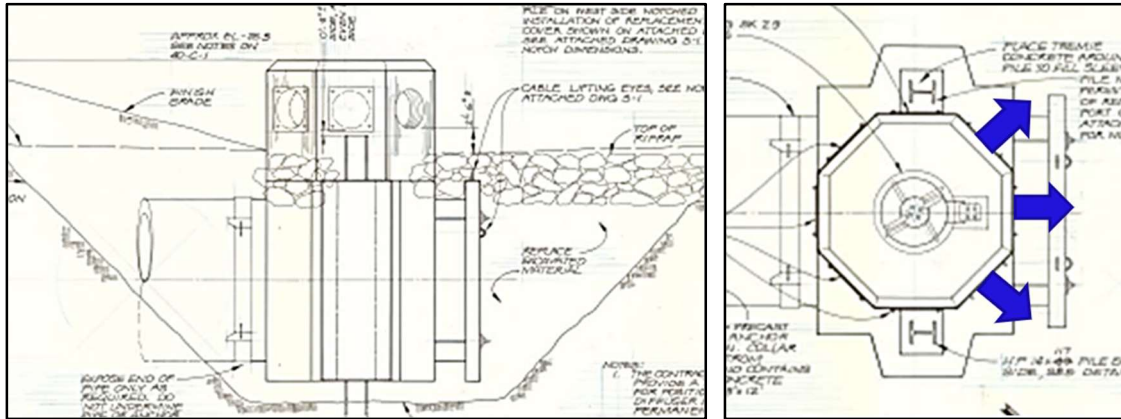
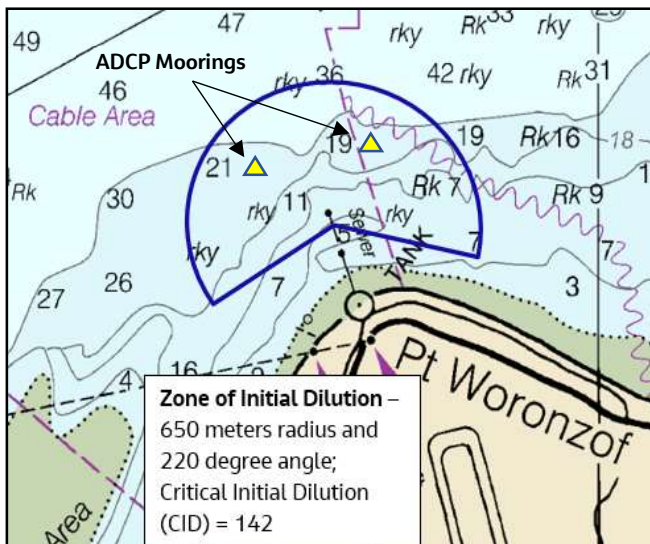
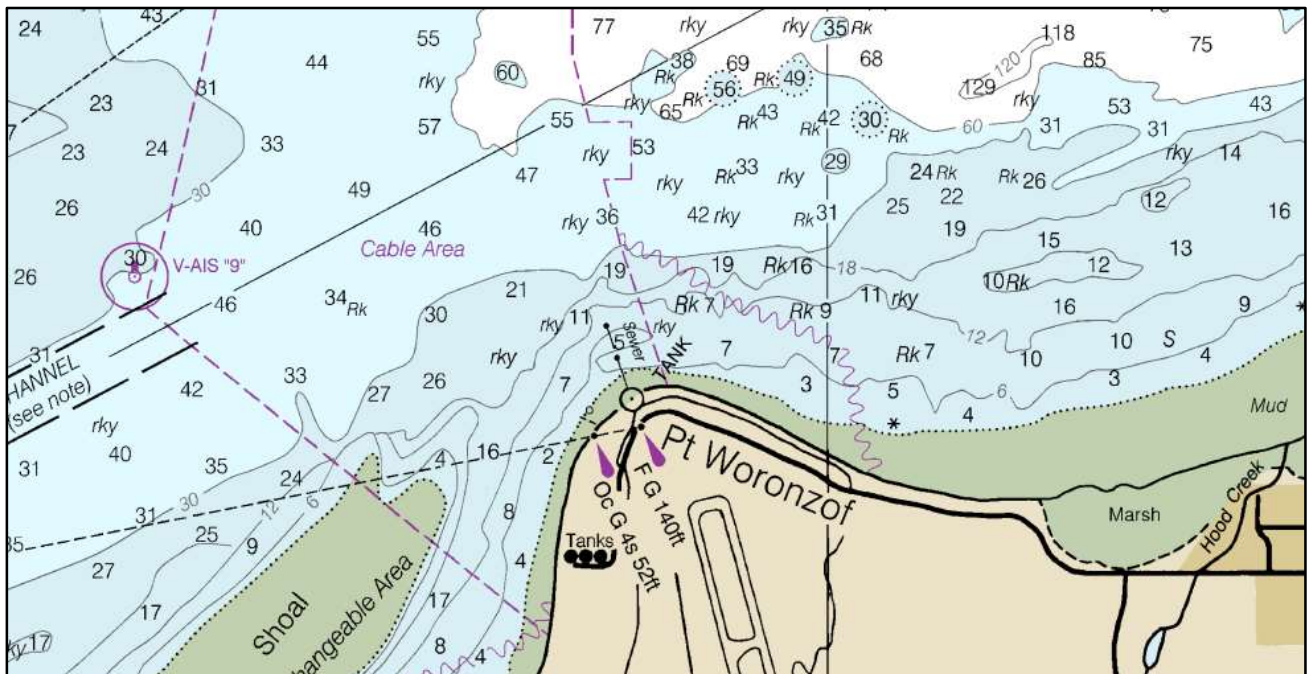


Asplund WPCF Outfall Dilution Performance Study - Overview



Outfall 001: 84-inch outfall with vertical turret with 8, 23-inch ports – 3 open and 5 closed



Asplund WPCF Outfall 001 Location (above)

ZID and ADCP Target Locations (left)

Study Objectives

This Outfall Dilution Performance Study is designed to provide:

- (1) site-specific field measurements of the dilution performance of the AWPCF Outfall 001 under neap tidal conditions at Point Woronzof to represent critical mixing conditions,
- (2) detailed field measurements of the outfall discharge plume concentrations at specific locations and distances from the outfall,
- (3) simultaneous field measurements of receiving water characteristics (current speed and direction, and water column density stratification) and dilutions to use to select, calibrate, and validate a representative dilution model for use in discharge dilution modeling, and
- (4) dilution modeling results for a range of tidal and seasonal Cook Inlet conditions and effluent discharge conditions.

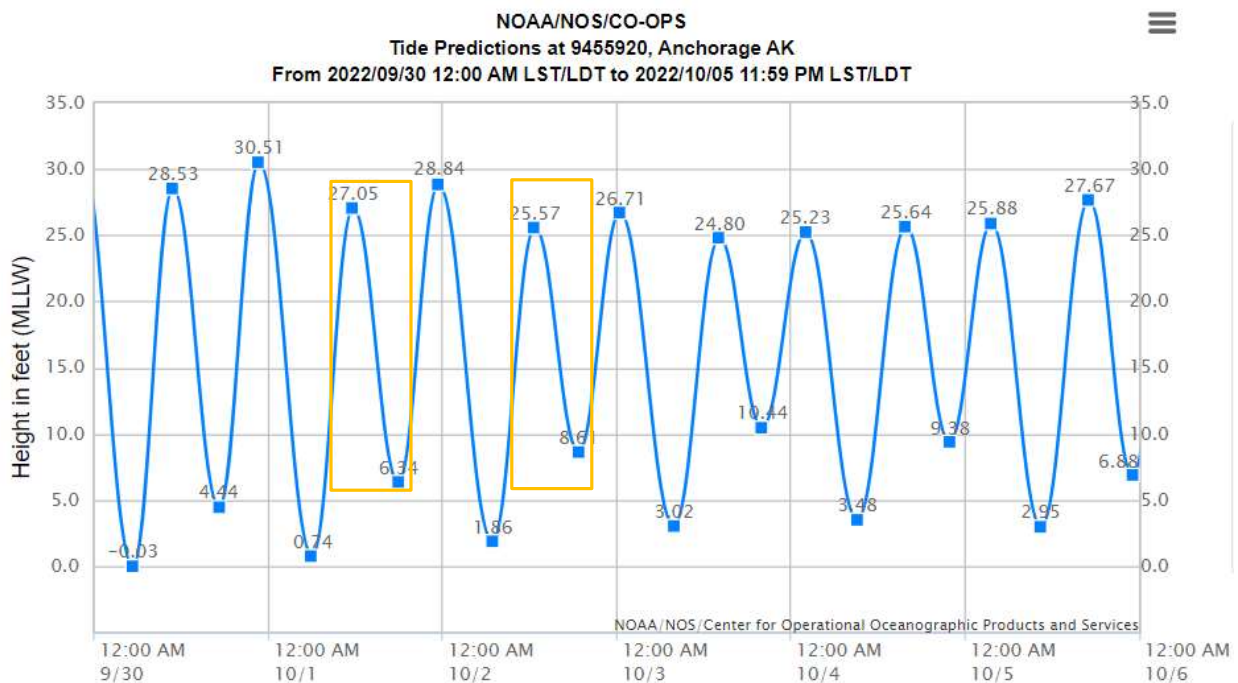
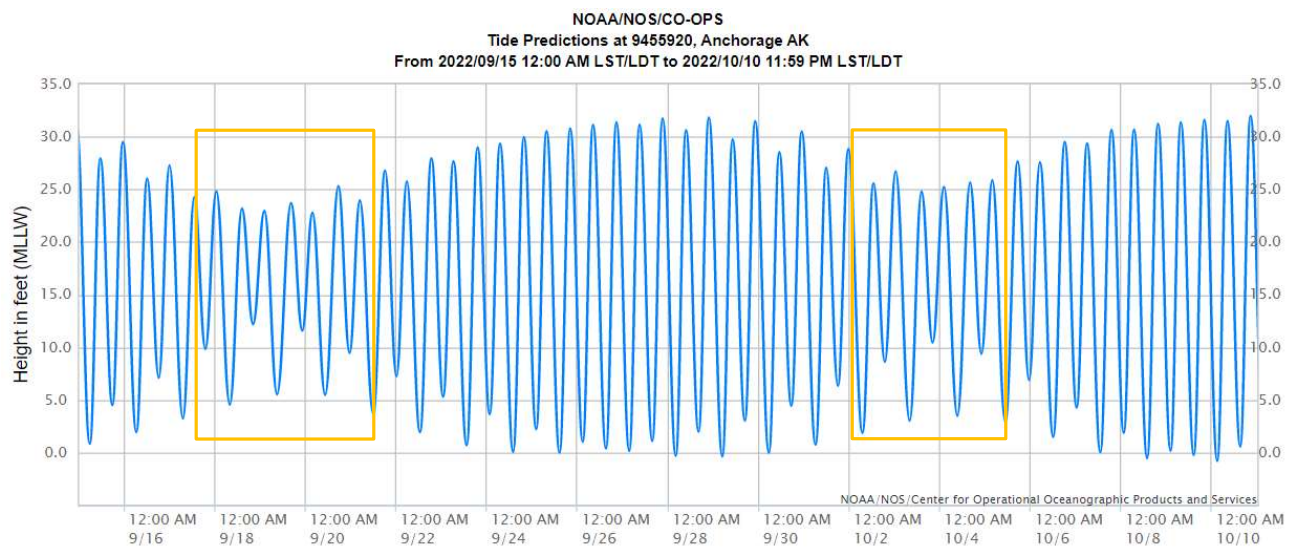
Study Approach

The following project elements and stages define the study approach:

- Outfalls Mixing Zone Study Plan - prepare and submit a technical Outfall Mixing Zone Study Plan to be reviewed and approved by EPA and DEC prior to conducting field study
- Field Study Planning - coordinated planning for field study with AWWU personnel to ensure effective and efficient operations and adherence to health and safety protocols
- Field Study - setup and perform site-specific field measurements and two-days of tracer studies of the AWPCF Outfall (under neap tide conditions) in accordance with procedures and quality assurance/quality control (QA/QC) defined in the Study Plan
- Study Data Analyses - develop the field measurements of dilutions and current measurements to summarize and document the outfall dilution performance under neap tide conditions.
- Dilution Modeling - conduct dilution modeling analyses applying field tracer study conditions to select the most representative dilution model to apply, then perform dilution modeling of critical ambient current and stratification conditions to determine dilutions and define the ZID boundary.
- Technical Report - prepare a detailed technical outfall dilution performance study report for submittal to EPA and DEC. The report will document field methods, field-measured dilutions and currents, environmental mapping of Pt Woronzof region, and dilution modeling methods and results. Report appendixes will include the Study Plan, outfall as-built drawings, current measurements and bathymetry data, and dilution modeling input and output.

Field Study Schedule

Field tracer study scheduling targets Neap Tides to conduct field study during minimal tidal elevation changes and lowest ambient current velocities to capture critical dilution conditions. Available neap tide windows for tracer study are Sept. 17-21 and Oct. 1-4. Need to perform study during period when ADCP current meters are installed and recording.



Tracer Study Day 1 – Sat. Oct. 1 – 0830 to 1900 (Sunrise 0810 & Sunset 1930) – Measurements during Flood (0830-1140), Ebb (1140-1750), and early Flood (1750-1930) periods

Tracer Study Day 2 – Sun. Oct. 2 – 0830 to 1900 (Sunrise 0810 & Sunset 1920) – Measurements during Flood (0830-1240), Ebb (1240-1845) to low slack periods

Field Study Equipment and Instruments

Field Equipment and Instrumentation for the Outfall Performance Study

Equipment Item	Purpose	Number of Units	Accuracy Standard
SeaBird Electronics SBE-19 Plus V2 CTD	Measure ambient conductivity, temperature, and depth	2	Conductivity: ± 0.001 S/m Temperature: $\pm 0.01^\circ\text{C}$ Depth: ± 0.05 m
Turner Designs SCUFA submersible fluorometer	Measurement of fluorescent dye concentrations in effluent	2	Minimum dye detection to 0.2 ppb*
Turner Designs 10-AU field fluorometer	Measurement of fluorescent dye in receiving water	2	Minimum dye detection to 0.2 ppb*
Trimble GNSS Differential GPS and Hypack Navigation Software	Vessel positioning and precision navigation	2	± 0.5 m
MasterFlex peristaltic pump	Used for dye injection into effluent at flow-paces rate	2	0.2 mL/min
Peristaltic pump	Pump receiving water through the 10-AU fluorometer	3	1 mL/min (maximum delivery rate of 25L/min)

*Accuracy of 0.2 ppb is assumed for calculation purposes; actual instrument accuracy is 0.1 ppb.

$^\circ\text{C}$ = degrees Celsius; cm/sec = centimeters per second; L/min = liters per minute; m = meter; mL/min = milliliters per minute; ppb = parts per billion; S/m = Siemens per meter.

Equipment Calibration

All equipment will be obtained prior to the beginning of the dye study and each instrument will be checked and calibrated prior to the tracer study and, when appropriate, following the study. Calibration methods for each instrument are described below:

- **ADCP Current Meters** – These instruments are calibrated by the manufacturer according to their specifications. Calibration results will be used during data reduction.
- **CTD instruments** – Conductivity, temperature, and depth instruments are factory calibrated and the current calibration certificates will be confirmed before conducting the dye studies. Calibration results will be used during data reduction and calculation of the water column density structure.
- **Dye Pumps** – Dye injection pumps will be calibrated at the locations where they will be used. The pumps are equipped with a micrometer control to accurately determine pumping rate. The flow rate scale will be calibrated with the dye at ambient temperature by repeatedly discharging dye into a graduated cylinder for a fixed period of time at various flow rate scale settings. Dye flow rates will be verified and logged at 1-hour intervals during the field study.
- **Fluorometers** – Turner Designs SCUFA and 10-AU field fluorometers will be calibrated according to the manufacturer's specifications so they measure total dye concentration in appropriate range for their use. Measurements in the receiving water will have a range of 1 to 100 ppb; effluent initial dye measurements will have a range of 500 to 1,500 ppb (target dye concentration of 750 ppb). Two types of dye standards will be prepared for the study—effluent standards for calibration of initial dye measurement instruments, and receiving water standards for calibration of Cook Inlet dye measurement instruments. Receiving water will be collected from the Port dock prior to the dye study and used to prepare receiving water dye standards.

Immediately following the dye study, a second set of fluorometer calibration measurements will be recorded using effluent, dye, and background water. The second set of calibration measurements will be compared to the pre-study calibration data after correction for temperature. The pre-and post-study calibration curves will be used to correct or adjust the observed dye concentration and dilution.

Field study activities with stages and timelines are listed below:

- **Prior to Field Study** - Approximately 1 month prior to the field study, Jacobs and AWWU will conduct a pre-study coordination meeting at the AWPCF to review field study plans for dye tracer injection and initial measurements, work site access, safety, and security procedures.
- **Field Study Day 1 (Wed. 9/28)** – Travel and start instrument preparations
- **Field Study Day 2 (Thurs. 9/29)** - Field team mobilize to AWPCF, hold a coordination meeting with AWWU personnel to confirm site access, safety, and security procedures, perform effluent and receiving water collections for dye standards preparation, and prepare dye standards and perform instrument preparations.
- **Field Study Day 3 (Fri. 9/30)** – Field team setup of the dye injection equipment, conduct instrument calibrations, prepare field equipment, conduct dye study instrument testing, test dye injection and initial measurement equipment, and launch work vessel and tie-off at City dock.
- **Field Study Day 4 (Sat. 10/1)** – Field team conduct field tracer measurements of Outfall 001 discharge during daylight hours (0810-1930). The dye tracer study will involve metered injection of dye into the effluent at the AWPCF, measurements of initial dye concentration downstream of injection (post-chlorine tower), and water column measurements of dye, temperature, and conductivity from vessel on Cook Inlet. Dye tracer concentrations will be recorded during ebb and flood tidal conditions using water column profiles.
- **Field Study Day 5 (Sun. 10/2)** – Field team will conduct field tracer measurements of Outfall 001 discharge during daylight hours (0810-1920). The dye tracer study will involve metered dye injection into the effluent at the AWPCF, measurements of initial dye concentration downstream of injection (post-chlorine tower), and water column measurements of dye, temperature, and conductivity from work vessel on Cook Inlet. Dye tracer concentrations will be recorded during ebb and flood tidal conditions using water column profiles.
- **Field Study Day 6 (Mon. 10/3)**- On the sixth field day, Jacobs will download the 10-AU fluorometers, conduct post-study instrument calibrations.
- **Field Study Day 7 (Tues. 10/4)**- Completed instrument calibrations, clean up the dye injection equipment, de-mobilize from site, ship gear, and travel.

Field Study Staff

Field Team Lead – D. Wilson (Jacobs) – on vessel

Instruments Lead – Brad Paulson (Jacobs) – on vessel

KEI Lead – Mark Savoie – on vessel

KEI vessel team - Gary Lawley – on vessel

Instruments Assistant – Lindsey Smoot (Jacobs) shore

Injection/Initials Lead – Mike Stanaway - shore

Navigation Support – Jason Magalen (AKS) - on vessel